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GUIDES TO TRAFFIC SAFETY

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF PUBLIC ROADS

GUIDES TO TRAFFIC SAFETY

THIS REPORT, prepared by the Executive Committee of the National Conference on Street and Highway Safety to outline methods suggested by experience for dealing with current pressing problems of street and highway safety, was unanimously approved by the Fourth National Conference, Washington, D. C., May 23-25, 1934. Revised by the executive committee, May 1937.

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U. S. DEPARTMENT OF AGRICULTURE

U.S.
BUREAU OF PUBLIC ROADS



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II

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ACCIDENT STATISTICS

Our annual death toll of motor-vehicle accidents first exceeded 15,000 in the year 1922. Three years later, in 1925, deaths went above 20,000 for the first time. Tremendously increased use of motorcars, increased speeds, and other factors accelerated the death rate, with the result that 1929 brought more than 30,000 deaths.

The total rose to 33,675 in 1931, then receded to 29,451 in 1932 in response to a sharp reduction in traffic. But by 1934 it had mounted to 36,101 and by 1935 to 36,369.

About 200,000 persons have met death in motor-vehicle accidents in the United States since the Third National Conference on Street and Highway Safety in 1930. This total is less than it would have been had previous annual increases been steadily maintained, but the number is so staggering as to indicate clearly the importance of increased national efforts for traffic safety.

Table 1 shows at a glance the upward trend in motor-vehicle deaths since 1913.

TABLE 1.—*Number of deaths resulting from motor-vehicle accidents and death rates*

Year	Deaths	Death rate			Year	Deaths	Death rate		
		Per 100,000 population	Per 10,000 cars	Per 10,000,000 gallons of gasoline			Per 100,000 population	Per 10,000 cars	Per 10,000,000 gallons of gasoline
	<i>Number</i>	<i>Number</i>	<i>Number</i>	<i>Number</i>		<i>Number</i>	<i>Number</i>	<i>Number</i>	<i>Number</i>
1913.....	4,227	4.4	30.7	(1)	1929.....	31,215	25.7	11.7	22.0
1918.....	10,723	10.4	16.8	(1)	1930.....	32,929	26.7	12.4	22.3
1923.....	18,394	16.5	12.1	(1)	1931.....	33,675	27.1	13.0	21.9
1924.....	19,379	17.1	10.9	(1)	1932.....	29,451	23.6	12.2	20.7
1925.....	21,877	19.0	10.9	25.5	1933.....	31,363	24.9	13.2	22.0
1926.....	23,431	20.1	10.6	23.9	1934.....	36,101	28.5	14.4	23.6
1927.....	25,796	21.8	11.1	23.5	1935.....	36,369	28.5	13.9	22.4
1928.....	27,996	23.3	11.4	23.0					

¹ Gasoline-consumption figures are not available prior to 1925. Those for several years thereafter are in part based on incomplete or not strictly comparable data and must be accepted with reserve.

Table 1 shows that in proportion to population motor-vehicle death rates rose uninterruptedly until 1931, and that the drop in 1932 was followed by an increase continued up to the present. In proportion to number of cars registered there were fewer deaths each year until 1926, when a low point of 10.6 fatalities per 10,000 cars was reached. The rate then increased to 14.4 in 1934, but by 1935 had decreased again to 13.9. In relation to gasoline consumption, which should furnish the best index of the amount of motor-vehicle use, the death rate, except for a slight interruption in 1930, showed a steady though small decline from 1925 through 1932. The rate went upward in 1934 to predepression levels, but there was improvement in 1935 and the preliminary 1936 figures indicate a further recession approaching the 1932 low.

These rates make it evident that in relation to the volume of traffic on our highways deaths have been decreasing, but in relation to the population the picture has been steadily growing worse. It should be pointed out that the greater volume of traffic need not be considered an insurmountable obstacle to a reduction in the number of deaths. Actual reductions in accidents have been achieved in many cities and States in spite of increases in travel, and a Nation-wide reduction should be possible when known remedies receive a Nation-wide application.

The appalling number of deaths resulting from motor-vehicle mishaps should not obscure the much larger number of injuries and less serious accidents occurring each year. In addition to the 1935 death total of 36,369, for example, there were about 1,300,000 non-fatal injuries, and perhaps six times that many accidents causing property damage only. Numbers cannot express the suffering and sorrow involved in this death and injury total. It can be stated, however, that the losses to the American public from the deaths and injuries, calculated on a conservative basis, amounted to about \$800,000,000; while the addition of property-damage costs, though difficult to estimate, would appear to bring up the total loss from motor accidents to well over \$1,500,000,000 a year.

Black as the general picture is, analysis shows that certain States, certain age groups, and certain types of motor-vehicle drivers have achieved better results than the country as a whole. Either their percentages of increase in accidents have been much less, or actual declines have been achieved. These are bright spots in the picture, encouraging indications of results attainable by organized effort, without which the total record would appear still worse than it does. Some of these encouraging trends will now be reviewed briefly and their apparent significance discussed from the standpoint of a national safety program.

CHILDREN VERSUS ADULTS

One of the most striking contrasts in any study of motor-vehicle accidents is found in comparing child and adult experience. Table 2 shows the annual motor-vehicle death totals for children and adults since 1922, the year when the national child-safety education movement started.

TABLE 2.—*Number of deaths resulting from motor-vehicle accidents, 1922-35*

Year	Children	Adults	Year	Children	Adults
1922	4,219	11,107	1929	5,382	25,833
1923	4,495	13,899	1930	5,051	27,848
1924	4,807	14,573	1931	5,030	28,645
1925	4,974	16,903	1932	4,148	25,303
1926	5,069	18,361	1933	4,395	26,968
1927	5,360	20,436	1934	4,392	31,709
1928	5,259	22,737	1935	¹ 4,100	¹ 32,300

¹ Estimated.

This table shows that during the last 10 years for which figures are available, 1926 to 1935, inclusive, child deaths decreased 18 percent while adult deaths increased 91 percent. From 1929 to 1935 there was a reduction in child deaths every year.

LICENSE VERSUS NONLICENSE STATES

Another marked contrast in motor-vehicle death trends is found by comparing the records of States with drivers' license laws requiring an examination of all new drivers, and administered by a strong central authority, with those of States not having such laws. Compared either in relation to registration or gasoline consumption, the average motor-fatality rates of the nonlicensing States show much greater increases over periods of years than do those of the licensing States. In the 11 States that had standard license laws and administration during most of the decade 1926-35, the gas-consumption death rate dropped 15 percent, while in the unlicensed States it increased 28 percent. In 1935 the license rate was 19.5 and the nonlicense rate 24.1

PRIVATE VERSUS COMMERCIAL VEHICLE DRIVERS

From 1927 to 1935 there was an increase of only 5 percent in the number of commercial-vehicle drivers involved in fatal accidents, whereas the number of private-car operators involved in such accidents increased 58 percent. Truck drivers in fatal accidents were reported to have increased 15 percent, but the number of bus drivers decreased 20 percent and taxicab operators nearly 50 percent.

RURAL VERSUS URBAN EXPERIENCE

Some years ago cities received blame for an undue proportion of motor-vehicle fatalities because persons injured in accidents occurring outside their limits were brought in to die in city hospitals. The United States Census Bureau took steps to correct this error in the records, and it soon became apparent that in the aggregate the motor-vehicle accident problem was even more serious in the small towns and country areas than in cities. Census Bureau figures for 1934 show that of the 36,101 deaths in that year, only about 12,900 resulted from accidents occurring in cities of 10,000 population or more, the remainder (approximately 23,200) occurring in smaller places and in the country. It is estimated that in 1936 the death totals were: Urban 11,800, small cities and rural 26,000.

Not only do rural fatalities exceed urban by a proportion of 2 to 1; the recent fatality trend in rural areas has been much worse than in cities. In 1924 rural deaths numbered slightly more than 10,000 and urban deaths 9,300. During the intervening years fatal accidents in rural areas, however, increased 165 percent, whereas those in cities increased only 26 percent.

EFFECTS OF ORGANIZED EFFORT

The bright spots in the traffic-accident picture that appear from the above comparisons take on special significance when it is realized that without exception they have occurred in those groups or areas where there is greater control of individual action by agencies of organized society. To be specific, a large proportion of children under 15 are in school and are constantly subject to instruction and, if necessary, discipline; their younger brothers and sisters are at home and are under parents' supervision. In States with drivers' license laws, unfit drivers are not allowed to operate cars and reck-

less operators are taken off the streets by revocation and suspension of their licenses. The employer of commercial-vehicle operators is in a position to instruct his drivers in safe operation and to discipline them if they do not cooperate. Practically every city has made serious efforts to cope with its traffic problem, whereas, except in recent years in a few States, there has been no patrolling of rural areas to insure safe driving that has been at all comparable with what can be accomplished by a well-managed city police force. In other words, the social control of motor-vehicle drivers and pedestrians has unquestionably been effective in keeping the accident rate below what it would otherwise have been.

Another definite indication that accidents can be controlled was found in studying the results of the national traffic safety contest among cities for 1934. Although there was a large increase in traffic and in accidents during 1934, the cities participating in the contest experienced an average of only 6 percent over the average for 1931-33, while the other cities with populations of 10,000 or more recorded a 12-percent advance. In addition to this evidence of average improvement in the groups of cities working in the contest, the death records of cities of more than 500,000 population were studied in relation to the accident-prevention activities which they carried on as reported in the contest. This correlation proved that the cities with all-round accident prevention programs—including engineering, education, and enforcement activities—enjoyed greater reductions in deaths than those cities having little or no safety activity. Furthermore, it was discovered that in most cases no single activity stood out as being able alone to influence the accident record, an all-round program evidently being essential. Similarly there are definite showings of lower fatality rates in a number of States which are carrying on continuous organized safety work.

No attempt has been made in this brief review to give accident records for particular States, cities, or population groups or to show the circumstances under which motor-vehicle accidents occur. Official statistics of automobile fatalities by States and principal cities are published by the United States Census Bureau. More comprehensive data, including ages of drivers and victims, street locations, weather conditions, actions and conditions of pedestrians and drivers, time of day, and so forth, are regularly included in the reports of city police and State motor-vehicle departments. These are summarized monthly in *Public Safety*, issued by the National Safety Council, and presented fully with extensive comparison and analysis in *Accident Facts*, the annual statistical summary of the Council. A study of these detailed accident circumstances is essential, of course, in determining just how the education, engineering, and enforcement program should be carried on to produce greatest results—just what measures of social control should be adopted. This is further discussed in the section beginning on page 12.

LEGISLATION

Uniform, up-to-date, reasonable traffic laws and ordinances are vitally necessary to a solution of our traffic problems.

The great majority of law-abiding drivers and pedestrians, who desire to obey the laws, have difficulty in doing so if the laws are not clear and reasonable or if they are confused by differences in

the laws of neighboring States or cities. If, on the other hand, the law is simple, easy to understand, unquestionably justified, and in line with the actual practices of careful drivers, extracts or summaries of appropriate provisions can be used as a textbook for teaching beginners or those brought into court for violations.

Again, the traffic laws must be reasonable and up to date or we cannot expect the police to enforce them. If the law sets a speed limit of 15 miles per hour where everybody knows that much higher speeds are both safe and customary, the police officer can hardly be blamed for not taking seriously either this or some of the other provisions of the law.

To a large extent the traffic laws form the basis for civil suits, and they must be reasonable and clear cut if innocent victims are to obtain redress and if, at the same time, drivers are not to be mulcted for damages in cases where they were not at fault.

Proper traffic laws are also necessary for the effective use of traffic engineering remedies. For example, the law must clearly and accurately define the responsibilities of drivers and pedestrians with respect to the observance of traffic signs and signals, or the latter will largely fail in their purpose. The law must also state who has authority to determine the need for, to provide, and to enforce the observance of traffic-control devices.

All traffic regulations which should be the same throughout the State should be covered by the State law, thus insuring uniformity among the cities as well as in the rural areas of the State. Only matters of distinctly local character, such as the restriction of parking on specified streets and designation of one-way streets, should be left to the local ordinance. The ordinance may, however, repeat certain parts of the State law if enforcement will thereby be facilitated.

The reasons for voluntary uniformity among the States in the regulation of traffic are so well known as hardly to require repetition here. It has often been pointed out that motor-vehicle traffic knows no State boundaries. But endless variety of conflicting regulations is a tremendous and quite unnecessary handicap. The truth of this argument is admitted by all, yet we are still far from the goal of uniformity. This can be attained only by the united, persistent efforts of intelligent legislators backed by interested organizations and citizens.

At the First National Conference on Street and Highway Safety in 1924 the great need for uniformity was clearly recognized. This was one of the chief reasons for the holding of a second conference in 1926, prior to which a large and representative committee of public officials and other traffic specialists from all over the country had devoted months of careful study to the formulation of the Uniform Vehicle Code. After discussion this was adopted in that year by the National Conference on Street and Highway Safety, and also by the National Conference of Commissioners on Uniform State Laws and the American Bar Association. In 1930 the code was revised by action of these bodies, at which time the model municipal traffic ordinance, prepared in 1928, was revised and approved by the National Conference on Street and Highway Safety. Again in 1934 the committee on uniform traffic laws and ordinances presented certain revisions believed to take care of all

weak points in the code and ordinance revealed by experience as well as to meet new conditions.

UNIFORM VEHICLE CODE

The code as now revised contains the following:

I—UNIFORM MOTOR-VEHICLE ADMINISTRATION, REGISTRATION, CERTIFICATE OF TITLE, AND ANTITHEFT ACT

This consolidates the vehicle registration and antitheft acts of the 1930 code, thereby eliminating a certain amount of duplication, and also contains a number of important additional administrative sections, including provision for a highway patrol.

All States have long recognized the need for some form of administrative organization as the starting point for motor-vehicle control. They vary considerably in their conceptions of what this organization should be and how extensive should be its powers and duties. The uniform act seeks to offer a complete but not excessive administrative organization.

II—UNIFORM OPERATORS' AND CHAUFFERS' LICENSE ACT

Because the importance of requiring all motor-vehicle operators to be licensed has not been as universally recognized as that of registering vehicles, and because the administration of the licensing system requires special, though not unduly complex, administrative machinery, the Operators' and Chauffers' License Act of the 1930 code is retained as a separate act, liberalized to meet objections that have been raised to the system without materially weakening it or interfering with the procedure found effective in the States experienced in the licensing system.

The resistance of the past in certain parts of the country to the licensing of operators is disappearing, and it is becoming increasingly recognized that this is an essential element in traffic control and reduction of accidents.

III—UNIFORM CIVIL LIABILITY ACT

This is an addition to the former code. In large measure, however, it is an assembly of related sections drawn from the various acts in the 1930 code and from the American Automobile Association Safety Responsibility Act together with certain additional provisions deemed appropriate.

IV—UNIFORM SAFETY RESPONSIBILITY ACT

The revised code for the first time contains a financial responsibility act.

The previous national conferences did not deem compulsory automobile insurance sufficiently related to safety to warrant its adoption as a safety measure. Experience has, however, indicated that a modified form of insurance, or financial-responsibility requirement, largely free from the difficulties of a complete compulsory automobile-insurance system, provides a valuable means not only of protecting the public against much irresponsible driving but also

of exercising an important influence for safe driving. Such a measure, proposed and sponsored by the American Automobile Association, has been passed and found effective in a considerable number of States and is the basis of the act included in the revised code. This proposed act is compulsory only as to those who have been convicted of serious traffic violations or who have unsatisfied judgments standing against them as the results of traffic accidents.

The adoption of these first four acts of the code in substantially the form in which they are presented is recommended.

V—UNIFORM ACT REGULATING TRAFFIC ON HIGHWAYS

This is the act of the same title in the 1930 code, revised in certain particulars in the light of recent experience, especially as to speed, vehicle-lighting requirements and size and weight restrictions. The act is also amplified to provide for periodic inspection of vehicles. Not only is this act based upon underlying principles that have proved sound and essential, but the language has been worked out with the utmost care to provide clarity and practicability and to conform to court decisions.

It is therefore recommended that it be adopted verbatim in every State which does not have substantially the same provisions.

MODEL TRAFFIC ORDINANCES

This embodies very little change in substance from the 1930 ordinance. The arrangement has, however, been materially changed to separate the administrative provisions from the operating rules which every motorist and pedestrian should know. The latter have been further segregated into (a) local provisions, such, for example, as those for control of parking, one-way operation and similar matters, and (b) basic rules of the road, which should be covered by the State law but which it may be desirable to include in the ordinance of a given municipality, either because they are not adequately covered by the law of the particular State or because constitutional or enforcement requirements make appropriate their repetition in the municipal ordinance.

It is recommended that each municipality consider carefully which provisions of the three parts of the model ordinance it requires and adopt them in the form presented.

MANUAL ON UNIFORM TRAFFIC-CONTROL DEVICES

Closely allied to the foregoing legislative standards is the Manual on Uniform Traffic Control Devices for Streets and Highways prepared by a joint committee of the American Association of State Highway Officials and the National Conference on Street and Highway Safety. This manual is a consolidation, revision and amplification of the previous standard manuals for rural highways and city streets, and it is recommended for general adoption.

ADMINISTRATION

The handling of the traffic situation in this country may be likened to a tremendous business undertaking—one in which State and municipal governments have the major responsibility. In order to

conduct any business effectively there must be proper organization and a well-conceived program based on sound administrative policies. Our rapid increases in highway traffic and its many problems have not, in many particulars, been met by effective organization; and this is one of the fundamental reasons why greater progress has not been made in reducing traffic accidents and delays, and in improving traffic conditions generally. On the other hand, it is encouraging to note that many States and municipalities have recognized this basic need and have gone far in organizing to meet the situation.

We urge that the chief executive of each governmental unit recognize the importance of modern traffic problems and give active support to the traffic-improvement program. Informed public opinion has almost always supported progressiveness by the State and city in this field. It is recommended that governors, mayors, and city managers take the lead in formulating definite policies and a program for traffic improvement, and putting them into effect.

STATE TRAFFIC ORGANIZATION AND ADMINISTRATION

The principal functions of a State in meeting its traffic problems are—

To provide a satisfactory highway system, adequate to meet traffic needs and so maintained as to be as nearly accident-proof as possible.

To establish satisfactory State motor-vehicle laws, for reasons set forth in the section headed "Legislation."

To assume general supervision of the use of its highways, involving registration of vehicles, granting the privilege of driving to qualified persons and securing observance by the general public of the rules of the road and other traffic laws.

To study the traffic accidents and devise ways of reducing this toll to the minimum.

To exert such degree of control over the traffic activities of counties and municipalities as to secure substantial uniformity in traffic signs, signals, local driving regulations and other matters which directly affect the vehicle operator.

Of the foregoing functions, the first relates to highway construction and maintenance, the other four to regulation of highway use.

HIGHWAY CONSTRUCTION AND MAINTENANCE

All of the States have recognized the need for an adequate highway system and have set up effective State highway organizations. The Federal Government has cooperated through the Federal-aid system administered by the United States Bureau of Public Roads. For many years the State highway officials have been organized in an effective American Association of State Highway Officials.

In the main the country is well advanced in the development of its primary highway system, though much modernization is needed. Less progress has been made in respect to county and other local roads outside of municipalities, and there has been a strong trend toward placing such roads increasingly under direct or supervisory control of the State highway authorities.

There is still much to be done in establishing further safeguards to traffic on both main and secondary highways. It is recommended that such work be definitely and adequately provided for in highway

programs of jurisdictions where this is not already being done. Highway planning surveys in progress in 40 States will provide a sound basis for improvement programs.

REGULATION OF HIGHWAY USE

In most States the public has been very slow to realize the need for effective organization to cope with the many problems of the use of highways which affect public safety. In the North Atlantic States and in a few States elsewhere this need has long been understood, and competent organizations have been built up under administrators with proper authority and understanding of their responsibilities. In many other States, however, responsibility for administration of the vehicle laws has either not been definitely assigned or has been placed as an incidental duty upon an official whose principal function is that of a collector of revenues and who has neither the time nor the staff to carry on important phases of the work of motor-vehicle administration or to profit by the experiences of other States.

In the Northeast the administrators have been cooperating effectively for years through an Eastern Conference of Motor Vehicle Administrators. In 1933 a highly important forward step was taken by the creation of a Nation-wide American Association of Motor Vehicle Administrators, with four regional divisions, one of which is largely based on the old eastern conference. The success of the organization is now assured and its effectiveness will be increasingly felt. The association should become the principal coordinating agency in motor-vehicle law improvement and administration.

The Bureau of Public Roads, under the authority of the Federal-aid highway laws, is also doing effective work on traffic problems, and may be expected to cooperate closely with this new organization of motor-vehicle administrators as it has done for many years with the State highway officials.

Supervision of the use of highways can be divided into two broad types of functions. One of these, vehicle law administration, has been quite generally recognized; the other, involving the engineering problems of highway use, is only beginning to come into prominence.

State motor-vehicle administration.—In States which have given the most attention to the effective administration of their motor vehicle laws, experience has shown that the following organization units are needed:

General administrative organization, consisting of the administrator and the necessary personal assistants.

Examiners to conduct the tests which must be passed before an operator's license will be issued, and to check on the reissuance of licenses in certain cases.

Special trained staff to handle suspension and revocation of operators' licenses and of vehicle registrations.

Highway patrol to foster observance of and enforce the traffic laws and regulations and to give information and assistance to motorists.

Personnel to supervise the inspection of the items of motor-vehicle equipment which have important relationship to safe operation.

Legal personnel for vehicle-code interpretation and amendment, to handle cases arising out of motor-vehicle laws and to guide municipalities in connection with their traffic ordinances.

Clerical staff for handling certificates of title, vehicle registrations, operators' licenses, and the collection, filing, summarizing, and publication of accident data.

The jurisdiction of the State administrator must necessarily cover local rural roads as well as State highways.

State traffic engineering.—This field, which includes the many engineering problems involved in the use of the highways, has already been recognized by the setting up of State traffic engineering agencies, or the beginnings of such organizations, in many States, including California, Illinois, Massachusetts, Michigan, Minnesota, Missouri, New Jersey, Ohio, Oklahoma, Oregon, South Carolina, Tennessee, Wisconsin, and the District of Columbia. The duties of a State traffic engineering organization are described in the section beginning on page 16. In the interests of safety and proper control of traffic every State should have a traffic engineer with necessary staff.

COORDINATION BETWEEN STATE UNITS DEALING WITH TRAFFIC MATTERS

Cooperation and coordination of efforts of State agencies involved are essential in dealing with various State traffic matters. For example, in matters of State legislation the State highway department, motor-vehicle administrator, traffic engineer, attorney general's office, revenue and budget agencies, legislatures, and the courts are usually involved. In general, informal day-by-day contacts between the various officials will result in satisfactory coordination, if the powers and duties of the various agencies are clear cut and do not overlap. In some cases, however, preliminary to improvement of State traffic organization, it may be desirable to create a temporary commission of appropriate State officials and actively interested citizen leaders to develop detailed recommendations.

LOCAL TRAFFIC ORGANIZATION AND ADMINISTRATION

In general, State traffic laws and standards for signs and signals apply in municipalities. A municipality has many important traffic functions, however, including enactment of local traffic legislation, construction and maintenance of local highways, considerable control over the use of its highways, direction of traffic by police, signals, signs, and markings, local observance and enforcement of traffic laws, and control of its traffic-accident situation.

Several different types of organizations are necessary for effective handling of city traffic problems. Some of these have long been established, but some are new and as yet not generally well known.

Other sections of this report deal in detail with the duties and methods of these units of organization. In this section the units are, therefore, only briefly described.

✓ STREET IMPROVEMENT AND MAINTENANCE

A trained engineering staff has long been recognized as necessary for the location, design, construction, and maintenance of municipal streets and highways.

✕ MUNICIPAL TRAFFIC ENGINEERING

It is now becoming recognized that many phases of the task of securing safe and efficient use of streets and highways are engineering in character. Hence the traffic engineer, who secures, keeps up to date and utilizes essential factual information, designs traffic-

signal systems, analyzes accident records, devises appropriate remedies, and controls the use of traffic equipment. Trained personnel is needed for traffic engineering work, and such service should be available for all municipalities. The section beginning on page 16 discusses methods of providing such service.

POLICE TRAFFIC DUTIES

The handling of police traffic problems has now become a major function of police departments. It is a specialized function, making experience and continuity of service of the utmost importance.

Traffic duties are frequently segregated under a traffic division, responsible for all traffic matters throughout the city and under the jurisdiction of an official next in rank to the chief of police. In many municipalities, however, traffic matters are still delegated to the various precinct or district commanders, although experience indicates that such a system cannot produce a unified and progressive handling of those traffic matters for which the police are responsible.

The best results are obtained by the use of squads having specialized traffic duties so far as justified by the traffic problems of the community. The following organization units have been found effective:

Executive staff, to assist the chief of the traffic division. Adequate personnel for executive direction of the many police traffic duties is essential to efficiency of service.

Traffic officers' training school personnel, to operate schools for the training of new traffic officers and for "refresher courses" for all traffic officers.

Mobile patrol, on motorcycles or in automobiles, to maintain an orderly and efficient movement of traffic, and to induce obedience to and enforce the regulations. The mobility of these patrolmen makes them available for other duties, but they should be diverted as little as possible to "special details" unrelated to accidents or traffic movement.

Accident investigation squad, to make thorough investigation of serious traffic accidents promptly after their occurrence and develop effective cases for the prosecution of persons involved who were guilty of serious violations. The idea, developed to its present effective form in Evanston, Ill., is new but is spreading rapidly.

Accident and enforcement record division, to gather, file, and make the various police uses of these essential records. The importance of this activity requires that the records be kept in good shape and used effectively by police, the traffic engineer, and others interested.

Vehicle inspection squad, to check for overloading, inadequate brakes, and other serious defects, preferably with one or more permanent official vehicle-inspection stations.

Post duty group, to control traffic at intersections and at other fixed posts.

Parking violations squad, to prevent parking violations and apprehend violators or tag illegally parked cars.

TRAFFIC COURTS

Traffic cases differ in many respects from most other cases heard by police courts. Effective court treatment of traffic cases requires not only a thorough knowledge of both State and municipal traffic laws and regulations, but a different judicial approach from that appropriate in ordinary criminal cases. Separate traffic courts exist in many municipalities and are recommended for all larger cities. In smaller cities it is recommended that all traffic cases be handled by one magistrate, who may not, however, need to give full time to this work. Operation of traffic courts is further discussed in the section beginning on page 24.

LEGAL SERVICE

An important part of effective municipal traffic organization is the provision of adequate legal service for the preparation and defense of ordinances, prosecution of important traffic cases, and legal approval of contracts.

COORDINATION

Since a number of local governmental units share responsibility for certain traffic matters, it is essential that there be effective coordination between the various bureaus and divisions. The more the traffic functions are concentrated and the less the duties of various units overlap, the simpler is the problem of coordination. The necessary coordination may be attained by cooperation of the officials concerned. It is sometimes desirable to set up an official traffic commission, made up of representatives of the various governmental units involved and a liberal number of interested citizen leaders appointed by the mayor and representing the major private groups most affected.

The cooperation proposed should extend not only to making the best use of existing facilities but also to the many phases of city and regional planning which have a relation to traffic.

This subject is treated further on page 23, where various methods of coordination of traffic activities are discussed from the educational standpoint.

ACCIDENT RECORDS AS THE BASIS OF ACCIDENT PREVENTION

Traffic-accident records have two main purposes—to impress all concerned with the gruesome statistics and spur them to do their part to reduce the toll, and to find scientific remedies from study of the accidents and their causes. The first purpose is served by publication of general totals, particularly of fatalities, and comparisons with previous records. The second is accomplished only by accurate reporting and study of details.

An accident—whether in traffic or elsewhere—always means that something is wrong. In view of the high total cost of accidents and the large sums spent for street improvements, traffic-control equipment, police departments, and courts, it is unquestionably a good investment to spend a moderate amount in collecting accident information and studying it in every possible way to determine what is wrong and how the various remedies are working, or to ascertain what others may be needed.

There are four principal factors in traffic accidents which require study: (1) The driver, (2) the pedestrian, (3) the vehicle, and (4) the location. The report of every traffic accident should contain the facts falling within each of these groups and should, either in itself or when studied in conjunction with other cases, point the way to a practicable remedy.

COMPARISONS NECESSARY

Intelligent study of the accident problem requires comparisons of one record with another. Thus, if two cities have an equal number of adult deaths, but the first city has twice as many child fatali-

ties as the second, it needs to analyze more carefully its child accidents and do something about them.

Within a city, comparisons should be made to determine which intersections, which streets, and which districts have the most accidents and thus require the most attention. Comparisons from one period to another are also necessary, primarily to discover how well the remedies for accidents are working. Scientific traffic planning, for instance, demands that a "before-and-after" study of accidents should be made every time a new traffic-control device is installed or a new regulation affecting accidents is adopted.

KINDS OF UNSAFE DRIVING

Drivers and even public officials often do not really believe that certain traffic rules are necessary for safety and that violation of them causes many accidents. Every accident report should therefore show what violation or unsafe practice by driver or pedestrian—or what combination thereof—entered into the case and caused or helped to cause the accident. Tabulations of these causes or circumstances are of great value to editors, speakers, educators, and others seeking to improve the safe driving and safe walking habits of the general public.

Many traffic accidents are due in part, at least, to unsatisfactory conditions of vehicles. Recent developments in accident investigation now make it easier than before to ascertain these vehicular defects of cars involved in accidents. Accurate information on vehicular defects contributing to accidents can be made a powerful weapon in the campaign for safer cars.

In addition to the parts played by the drivers, the pedestrian, and the vehicle, it is also true that a great many accidents can be primarily charged to faulty street lay-out, to the presence of unsuitable signs and signals or their absence where needed, or to obstructed view. It is now common practice to investigate a particularly hazardous intersection or other location by diagramming the accidents that have occurred there over a period of time so that the particular kinds of accidents that have occurred can be carefully studied in conjunction with the physical characteristics of the location.

RECORD SYSTEM SHOULD SERVE MANY PURPOSES

A good system of traffic-accident reporting should provide facts that will through study tell the responsible public official what needs to be done about any or all of the factors in the accident situation.

Accurate accident reporting is in fact an essential adjunct to the traffic remedies discussed in the three following parts of this report—engineering, education, and enforcement. Successful safety efforts require the use of accident records for all of these purposes.

AVAILABLE ACCIDENT RECORDS

The Federal Government, through the Bureau of the Census, provides authoritative statistics of automobile fatalities at 4-week intervals by principal cities and each year by States and cities. They

do not cover nonfatal accidents and do not give any indications of the causes.

A number of the State vehicle commissioners have effective organizations for the compilation and analysis of accident records. They publish illuminating figures for number, kind, and primary causes of accidents, and other pertinent information. Some of them also utilize the records as herein suggested to discover remedies for conditions conducive to accidents.

Many cities also recognize the importance of accurate accident reporting and analysis and do effective work along this line. Unfortunately there are all too many other cities in which little is done in this direction.

Among private organizations the National Safety Council makes compilation and analysis of accident reports one of its major projects. It issues an annual summary of accident facts and presents other accident data in its monthly publication. As a basis for those records it has promulgated the uniform accident reporting forms described below.

A STANDARD SYSTEM

The necessity for accident records in the safety program has always been recognized by the National Conference on Street and Highway Safety. Its several statistics committees have also emphasized that progress would be facilitated if all governmental departments—both local and State—would adopt essential uniformity in their definitions of terms, report forms, and methods of summarizing and publishing results. Only in this way, it was felt, could different localities be accurately compared, the most suitable preventive methods devised, and national information on the problem developed.

Acting on this idea, a standard traffic-accident reporting system was developed in 1924 by a group of public officials, statisticians, and traffic engineers, functioning as the National Safety Council's Committee on Traffic Accident Records. This system has been under the constant scrutiny of the several hundred city and State departments using it and has been improved from year to year on the basis of recommendations made by these users.

The system comprehends four distinct steps: (1) A card form on which each individual traffic accident is reported; (2) a tally sheet and summary sheet by which persons injured and killed are classified by type of accident and age, and the more important circumstances summarized; (3) a spot map to visualize where accidents are occurring; and (4) a location file of the original report cards to facilitate studies of hazardous locations. Sample forms, with complete directions for their use, can be obtained without cost from the National Safety Council, Chicago, Ill.

SPOT MAPS

In all except the smallest cities a spot map of traffic accidents is an essential in the most effective promotion of traffic safety. A pin is stuck into the map at the proper point to represent each accident that occurs, the type of the accident being represented by the size, shape, and color of the pin.

Such maps show where accidents are accumulating and, when compared over successive periods, show changes in the distribution and concentration of accidents. Such concentration and such changes are the clues for the most effective use of traffic police, for engineering studies of the hazardous locations, for needed changes in signals, signs, and physical surroundings, and for traffic regulations. When reproduced in newspapers or otherwise used in publicity, spot maps also warn the general public that cautious driving is especially necessary in certain areas.

FILING OF REPORTS

Any accident-reporting procedure is not complete until the individual reports are suitably filed. The suitability of any filing system must be judged by the use which is to be made of the file. Traffic-accident reports are frequently filed by date or by serial number. Such files are, however, of little or no use in any kind of accident-prevention effort.

In both States and cities, two systems of filing accident reports have been found essential for effective traffic-improvement activities. These are a file by location and a file by driver or drivers involved. Both files, properly cross-referenced, are recommended.

State motor-vehicle departments which supervise the licensing of motor-vehicle operators may consider the more useful of the two recommended files that involving the filing of accident reports along with their other records for the driver or drivers involved. Then, if there is any question of suspending or revoking the license of a particular operator, that individual's complete accident experience is immediately available.

A location file is also of primary importance to the State traffic engineer, highway departments, and highway patrol. There is an increasing demand in States for this type of file.

Most cities, having no direct control of licensing of drivers, will find the file of accidents by location to be the more useful to them. The discovery of accident locations, as previously stated, is facilitated by the spot map. When the spot map reveals an extra-hazardous intersection, street, or district, it is important to have the file of accident reports so arranged that all of the accidents spotted on the map at the location in question can be quickly taken from the file and analyzed. This requires filing the accident reports or copies thereof by location. For city use the location file is recommended as of primary importance. Complete directions for establishing, maintaining, and using a location filing system are available from the National Safety Council and the American Automobile Association.

Increasingly, cities are finding that the effective handling of enforcement requires records filed by drivers' names for accidents as well as violations. Traffic magistrates can deal more intelligently and effectively with a violator if, when his case is heard, the magistrate has for his guidance a record of both past violations and accidents of that driver. Furthermore, where State records are not complete or are not being actively used, police officials or magistrates can refer bad records of individual drivers to the State motor-vehicle administrator for suitable action as to suspension or revocation of licenses.

ENGINEERING

Engineering plays an important part in many phases of the traffic problem—the design of efficient and safe motor vehicles, the location, design, construction, and maintenance of adequate streets and highways, and the solution of many of the problems of traffic control and regulation. There has been much progress, but much remains to be done by engineers in the prevention of accidents and in the efficient and orderly handling of street and highway traffic.

AUTOMOTIVE ENGINEERING

Automotive engineers have long realized that improvements in design of vehicles and ease of maintenance can greatly reduce the accident hazard and the seriousness of accidents that occur. Among the improvements made in recent years in safety design of motor vehicles may be cited lower center of gravity, sturdier construction, better headlights and other lighting equipment, better brakes and brake equalizers, improved steering apparatus, easier handling, better road-holding qualities, better gear-shifting facilities, sturdier tires, safety glass and such refinements as adjustable driving seats, braking signal lights, better windshield wipers, reflector glass in taillights, speed governors on trucks, and lights indicating the width and height limits of larger vehicles.

Research is actively continuing and special attention is being given to the new problems created by the increasing speed of motor vehicles. Here, however, the automotive engineer is limited by factors outside of his scope—the highway and the driver—and there is grave need for automotive engineers, highway engineers, traffic engineers, enforcement officials, and others directly concerned to face the speed question squarely and reach agreement as to necessary limitations of maximum speeds for various conditions.

HIGHWAY ENGINEERING

As the traffic demands have become more severe, highway engineers have made progress in designing and building strong, durable, and reasonably economical highways with smooth surfaces and good drainage. Among the outstanding improvements from the safety viewpoint are the widening of traffic lanes to 10 feet, reduction in curves and grades, construction of better and wider shoulders free from obstructions, marking of center lines and lane limits, banking of curves, elimination of high crowns, improvement in guardrails, avoidance of dips, elimination of narrow bridges and underpasses, and up-to-date street and highway illumination.

Despite the improvements made, however, the seriousness of the accident hazard on rural highways is indicated by the 165-percent increase in fatalities in rural areas during the last 11 years as compared with the 26-percent increase within cities. A large proportion of accidents occur on highways which normally offer no special hazard. Although the driver may be blamed for most highway accidents, the highway engineer realizes that he must find ways to provide highways on which drivers will have less oppor-

tunity for accidents. For this purpose the following types of improvements merit special consideration:

- Sidewalks along highways.
- Nonskid surfaces.
- Center strips to form two separate one-way roadways.
- Avoidance of multiple intersections.
- Rotary traffic islands.
- Grade separations at railway crossings and highway intersections.
- Segregation of through traffic from local traffic.
- Street and highway illumination.
- Street systems in residential developments planned to discourage major traffic flows and to avoid pedestrian hazards.

Highway engineers should regularly set aside a definite part of their appropriations for the elimination of known physical hazards.

Sidewalks along highways, especially in the outskirts of municipalities and in the vicinity of schools and other gathering places, merit much greater attention than they have thus far had. In failing to provide a safe place for the pedestrian to walk along the highway and making it his responsibility to look out for himself by advising him to walk on the left side facing traffic, society has failed in its duty to school children and adults who must at times walk along the highways.

Progress in railroad-highway grade crossing elimination has been considerably expedited in the past few years. Under the National Industrial Recovery Act of 1933, 697 grade crossings were eliminated and 706 were protected by automatic devices. The Emergency Relief Appropriation Act of 1935 provided \$200,000,000 to be devoted to grade crossing projects. A report from the Bureau of Public Roads as of June 30, 1937, showed that through these funds 1,152 grade crossings had been eliminated by separation of grades or relocation of the railroad or the highway, 698 additional eliminations were under construction and 136 were planned for construction, making a total of 1,986 under this act. Protection by automatic devices had been or was being installed at 950 grade crossings.

These programs reflect a new viewpoint concerning financing of railroad-highway grade crossing eliminations. It is that the public should assume a major share of the expense of such eliminations, and it supersedes a policy which long delayed progress in this work—namely, that of imposing upon the railroads a large part of the cost of improvements.

Careful consideration is warranted concerning proper illumination of city streets and highways wherever justified for accident reduction and financially practicable. Reports from some localities show an increased proportion of accidents due to inadequate lighting conditions and indicate the desirability of careful study of the relation between illumination and the accident rate.

There are great future possibilities in planning street and highway systems and organizing community development, as at Radburn, N. J., so as to avoid much of the present hazard to pedestrians and children at play from motor traffic. The same principles can be applied to some extent in replanning and improving existing communities. However, because of financial and other limitations, this development can only come gradually in built-up areas, and the present major problem of street and highway safety is how to make the safest and most efficient use of existing facilities.

TRAFFIC ENGINEERING

As traffic problems have grown more extensive and complicated it has become increasingly evident that they cannot be solved by simple observation. The only approach which will yield satisfactory results is to gather and analyze all pertinent facts and base remedial measures upon the results of this procedure.

Since its inauguration in 1924, traffic engineering has grown steadily, until today more than 24,000,000 people live in cities where full-time traffic-engineering work is being continuously carried on. Numerous cities which do not yet have traffic engineers have had traffic surveys conducted by outside consultants. A number of States which have set up traffic-engineering agencies were mentioned in the section beginning on page 7. The Bureau of Public Roads is doing an increasing amount of work in this field and, through the Civil Works Administration, the Federal Emergency Relief Administration, and the Public Works Administration, the Federal Government has largely financed extensive traffic surveys in many localities. A professional Institute of Traffic Engineers was organized in 1930 to improve methods, develop standards and disseminate knowledge concerning traffic engineering.

WHAT THE TRAFFIC ENGINEER DOES

Traffic-engineering duties include:

- Conducting of traffic counts and other factual investigations.

- Control of the design, installation, proper timing and maintenance of traffic signals and signal systems.

- Design and plans for installation of traffic signs and markings.

- Engineering analyses of accident records and the devising of remedial measures.

- Studies of traffic laws and regulations and of desirable improvements thereof.

- Routing of intercity and other traffic.

- Cooperation with highway officials in the design of streets, traffic circles, throat widening at intersections, curb cut-backs, and traffic islands of various types.

- Assistance to the police in the analysis of law observance and enforcement and in the development of ways and means to improve conditions.

- Preparation of materials for traffic-education purposes.

- Development of standards.

- Cooperation with city planners in the development of major street plans.

The traffic engineer bases his remedies on impartial analysis of facts. He closely observes conditions and driving practices. He often operates a car many times through locations which he is studying in various directions and under various conditions in order to be sure that no important factors are overlooked.

TRAFFIC-ENGINEERING RESULTS

The Second National Conference on Street and Highway Safety in 1926 recommended that each municipality having serious traffic problems should set up a traffic-planning organization with a traffic-engineering staff. In the succeeding years such organizations working in many communities have accomplished numerous notable improvements. A few specific accomplishments may be cited:

Flexible progressive signal systems, permitting continuous movement of vehicular traffic. The first installation, in the Chicago Loop district, combined with a parking-regulation plan, which also resulted from a thorough-going

traffic survey, reduced accidents about one-fifth and speeded up traffic about 50 percent.

Increased traffic capacity at intersections. In one large city, the average traffic volume at signalized intersections was doubled by traffic-engineering methods.

Removal of unwarranted traffic signals. In another large city, several dozen unwarranted traffic signals, installed before inauguration of traffic-engineering service, were removed with benefit to traffic and reduction of expense.

Relief of police from intersection duty. The installation of the signal system in central Pittsburgh released for other duty more than half of the officers assigned there, and in downtown Boston signals relieved 59 intersection officers.

Reduction of delays. In a survey by the American City Magazine, one city reported that traffic engineering has accomplished as much increase in street capacity and speed of traffic by efficiently utilizing existing facilities as has been achieved by street widening.

Accident reduction. The first year's operation of the flexible progressive signal system on North Broad Street, Philadelphia, witnessed a reduction in fatal accidents from 23 to 11. Erection of stop signs at certain intersections was followed by a 56-percent reduction in accidents at those points. After installation of warning signs and markings were found warranted by traffic-engineering analysis, accidents were reduced 47 percent. Seven of the twelve cities which were winners in groups 1 to 4 in the 1935 National Traffic Safety Contest have traffic engineers.

ESTABLISHING TRAFFIC ENGINEERING SERVICE

State traffic engineers may operate under either the highway department or the motor-vehicle department. Since the duties largely relate to highway use, connection with the motor-vehicle department seems preferable in States where that department is suitably developed.

For municipalities the logical method of providing traffic-engineering service depends on various factors, including size, intensity of traffic, and governmental organization. Cities of less than 50,000 inhabitants can generally be served satisfactorily by a part-time traffic engineer, either employed for the purpose or made available through the State traffic engineering office on a consulting basis. Cities of more than 100,000 inhabitants should have a full-time traffic-engineering staff. In deciding how to provide such service cities between 50,000 and 100,000 should be governed largely by the severity of their traffic problem.

The traffic-engineering staff of a city may be under the department responsible for public safety or the department in charge of engineering and public works. A sound principle is to place it in the department with which it will normally have the greater number of contacts.

The problem of coordination is especially important with new governmental agencies. It will help to avoid friction if the powers and duties of the traffic engineer are clearly defined by ordinance.

EDUCATION

In one sense the entire program of the National Conference on Street and Highway Safety and its participating bodies is a program of education. The Conference has no legal authority. It can only exercise an educational influence upon legislators to enact uniform effective laws; on administrative officials to adopt modern, reasonable methods of enforcement and traffic engineering; on engineers to build more safety into the streets and highways and the

vehicles that use them; and on the educators themselves to include safety in the curriculum of every school and adopt the best methods of safety instruction and training.

In a narrower and more usual sense safety education means the arousing and instructing of the general public—children and adults, drivers, and pedestrians. Such education has two objectives, especially with regard to the adult population—mass education to arouse the collective interest and will, so that laws can be passed and enforced and other necessary remedies supported, and education of the individual to make him really understand the tragic consequences of accidents and his own personal obligation to avoid and avert them through personal carefulness, skill, and observance of the laws.

Educational methods found effective with various groups are outlined below.

THE PRESCHOOL CHILD

The child of less than 5 or 6 years is often the victim of others' carelessness, hardly of his own; for he is too young to be responsible. The safety of the little child is very largely dependent upon the teaching and example of his parents, though often his older brothers and sisters can help. There is really only one safety rule for the toddler, and that is to stay on the sidewalk, and he can be taught this rule with a little patience and perseverance. That the parents of the United States have not yet fully measured up to this responsibility is shown by the accident statistics, which do not reveal for the preschool child any such marked decrease as is shown for those of school age. This is a problem which should be approached through child-study groups and parent-teachers associations.

THE ELEMENTARY SCHOOL CHILD

No other group so large in numbers has shown such an improvement in the traffic-accident statistics as the group of children from 5 to 14 years of age, corresponding closely to the elementary and junior high school years. The downward trend for this group has been shown in the first part of this report. There can be no reasonable doubt that this is the direct result of the definite and specific instruction of grade-school children in safety, which has become so widespread during the past decade. There is hardly a grade-school principal or teacher today who is not giving some instruction in safety—although in some cases the methods and materials used leave much to be desired.

It should be noted that the teaching of safety is far more than the mere inculcation of specific habits and techniques. The problem of safety is one of the fundamental problems of the human race and has its roots deep in the psychological and philosophical bases for right living, so that a course in safety if rightly conducted is of far-reaching significance from a cultural and character-forming point of view.

The methods of classroom instruction and the related activities—junior safety councils and school-boy patrols—have been so widely published by various organizations as to need no detailed treatment here. It should be pointed out, however, that the teacher in the grades cannot be expected to give adequate safety instruction unless

provided with proper texts just the same as in teaching any other subject. Such teachers should be provided with the safety magazines, lesson outlines, posters, manuals, and other material now provided by the National Safety Council, American Automobile Association, National Conservation Bureau, Highway Education Board, and others. The distribution of manuals of safety instruction by the State departments of education is of equally great value.

HIGH SCHOOLS

It is fair to say that the high schools as a whole are nearly 10 years behind the grades in their recognition of safety. Yet in some ways the need is even greater. The little child needs to be taught how to cross the street. But the high-school student needs to be taught how to drive; and if he is not taught, he may kill or injure others as well as himself. He needs to be taught not only the mechanics of driving but the principle of fair play—the need for and the nature of traffic laws and regulations.

During the last 2 or 3 years a small but rapidly growing number of high schools have recognized this responsibility and taken important steps in working out satisfactory methods. These must differ from the methods in the grade schools, just as the high school and the grades differ in other respects. The methods which have proved successful include assembly or home-room programs, the display of posters, essay and poster contests, inclusion of safety in the courses in automobile mechanics, student safety councils, student motor-traffic clubs, and courses in driving, for all or a large part of the student body. Of these methods, the last three require further mention.

The student safety council commonly consists of one or two representatives from each home room, with a faculty adviser. The council meets regularly and has charge of developing and conducting the entire safety program of the school. One of its chief advantages is in the development of initiative and active interest.

The high-school motor-traffic club permits intensive study and discussion of various phases of modern motor-vehicle transportation, including the study of accidents and their prevention. The club is excellent for those who belong to it, but in most cases it must be limited to a fraction of the student body.

The drivers' school or instruction course is open to all students and is generally attended by those who are beginning or about to drive. It consists of a series of lectures, demonstrations, and discussions, given generally once a week and for periods in various schools of from 5 to 12 or even 16 weeks. The course includes a study of the mechanics of the automobile, particularly in its safety aspects, an analysis and explanation of the traffic laws and the reasons therefor, the social and economic background of the safety movement, and the elements and actual technique of good driving. In some States these courses are carried on with the active cooperation of the motor-vehicle department and lead up to the granting of drivers' licenses, where the students are of legal age and where this has the approval of the parents. This is a most significant movement and seems to indicate that the high schools of the country may generally and definitely assume the responsibility of teaching young people how to drive.

Details of plans and programs for high-school safety work can be obtained from the National Safety Council, the National Conservation Bureau, or the American Automobile Association.

TEACHERS, ENGINEERS, TRAFFIC OFFICIALS

There is obvious need for including courses in safety instruction in the curriculum of every training institution for teachers, as has been done for several years by leading colleges. Engineering schools are beginning to recognize safety as an element in both traffic-engineering and highway-engineering courses, although traffic engineering itself merits greater attention in college curricula. Progressive police departments likewise recognize the need for definite training of their traffic officers in city or regional police schools.

COMMERCIAL DRIVERS

If any proof is needed that traffic accidents can be reduced and that safety instruction and supervision bring results, the record of the truck, bus, and taxicab drivers, set forth in the first part, is certainly sufficient evidence. This record is the more remarkable in that it represents the average trend of all commercial drivers. As a large number of these drivers, especially those in the very small fleets, have had practically no safety training or supervision, it is evident that the more progressive and larger fleets must have made very great reductions in order to bring down the average; and this is in fact the case.

In general, the methods successfully used by large truck, bus, and taxicab companies are the same as those which have brought results in other industrial groups. They include careful inspection and maintenance of the vehicles, careful selection and training of drivers, supervision, discipline where necessary, and frequently rewards for good records.

As in the case of the grade schools, the methods of commercial driver accident prevention have become standardized and have been widely published by the National Safety Council, the Automobile Manufacturers Association, and bus and truck operators' associations. Reference is therefore made to such publications for details. Special mention, however, should be made of the great importance of two elements:

- (1) These drivers are under control of their employers.
- (2) The element of competition—of working for a reward or a prize—has been found extremely effective.

The great problem in dealing with private drivers is to find the equivalent of these devices.

THE GENERAL PUBLIC

A large percentage of the adult population are drivers at one time or another, and these drivers will be reached by any method that will reach the general public. Effective campaigns of public education for safety (including pedestrians as well as drivers) have been and can be carried on through the newspapers, the radio, posters, meetings, and special campaigns such as safety or courtesy weeks or months in connection with a continuous safety

program. A combination of these methods is much more effective than any one of them alone, and still more effective when it forms part of a general community safety program in which adequate engineering and enforcement activities are also included.

As indicated in the opening paragraphs of this part, the safety education of the community is necessary not only for teaching individuals to be more careful but also for arousing and mobilizing public opinion to support the officials in the performance of their safety functions. That such education brings results has been statistically proved through analysis of the city reports in the National Traffic Safety Contest. For this analysis and for more detailed suggestions and methods see the publications of the National Safety Council, National Conservation Bureau, American Automobile Association, Travelers' Insurance Co., and various other insurance companies and safety organizations.

Newspapers have a special opportunity to build up the background of informed public opinion which is essential to the success of any comprehensive traffic-safety program. Feature stories on automobile pages or elsewhere and the handling of news items on automobile accidents afford means of bringing out safety facts and supplementing the support for specific remedial measures given through the editorial columns.

COMMUNITY ORGANIZATIONS FOR SAFETY

Effective public education for safety requires not only a definite program but also a permanent organization to carry it on. In fact, the operation year after year of a community safety organization is itself an educational process. In no other way can the community leaders become so thoroughly convinced of the need for safety and the methods of getting it.

The community safety organization may take any one of several forms. It may be, especially in the larger cities, an independent safety council. It may be a committee of, or sponsored by, the chamber of commerce, the motor club, or some other civic organization. In some communities it has been an advisory committee or commission appointed by the mayor, city manager, or police chief.

Much more important than its name or formal affiliations are its make-up and its program. A successful community safety organization must be representative of the various official, business, and civic groups interested. These include the city departments having traffic or safety functions, the transportation, insurance, automobile and trucking companies, the merchants and others who use the streets, and the civic associations, including those of the women.

The program of activities must be selected from among those which have been found successful in other places. Above all, the organization must have competent, unselfish, energetic leadership.

It is impossible to lay down the details of an organization or a program that will fit all communities, or even all of a certain size. The organization or group which wishes to undertake a community safety program is best advised to consult at the outset either similar successful organizations in other cities or a national body with practical experience in this field.

A State or regional safety organization and program must, to be successful, follow a somewhat different plan. Volunteer workers

cannot assemble from different parts of the State for frequent meetings, as they can in a city organization; hence strong leadership at the headquarters is essential. Ordinarily, this means a competent, full-time manager. Appointment or formal recognition by the Governor and complete or partial financial support by the State may well be provided. The State safety organization should cooperate closely with the State motor-vehicle, health, highway, and school departments; the State chamber of commerce, automobile association, parent-teacher organizations, and other civic and business groups; and the local public officials, chambers of commerce, and similar bodies. Its most useful functions will generally lie in the fields of State-wide accident statistics, publicity, public and school education, legislation, and assistance to local safety organizations and campaigns.

LAW OBSERVANCE AND ENFORCEMENT

Traffic laws require motorists and pedestrians to do certain things which prevent accidents and prohibit certain actions which cause accidents. Practically every collision involves one or more violations of traffic laws. Mishaps cannot be prevented unless these laws are observed.

PLACE OF ENFORCEMENT IN TRAFFIC CONTROL

Enforcement is a vital part of traffic control. Its purpose is to induce violators to obey voluntarily in the future. Law enforcement is a form of education. For the large majority, educational enforcement, by means of warnings and otherwise, is desirable. Inevitably, however, there will always be some who will respond only to the strong arm of the law.

There is a close relationship between law observance, enforcement, and accidents. An enforcement demonstration conducted by the National Safety Council showed definitely that increased enforcement was accompanied by decreased accidents, and vice versa. In 17 cities participating for 1 month in the increased enforcement the average reduction in accidents was 13 percent. There are many instances of a systematic increase in convictions for violations being followed by a 15- to 50-percent reduction in accidents.

Lax enforcement of our traffic laws is undoubtedly at present one of the greatest weaknesses of our traffic-control program. There are, however, right ways and wrong ways of attempting to remedy this condition. Too drastic a campaign of enforcement may result in public antagonism and defeat its purpose. On the other hand, a reasonable, impartial program of enforcement which takes the public into its confidence at every step and explains the reasons why will almost certainly meet with success. In such a program the enforcement authorities should be thinking primarily in terms of accident hazards involved, or the effect on traffic flow, rather than in terms of mere technical violations.

GUIDING THE ENFORCEMENT PROGRAM

Since enforcement deals critically with private and public behavior, it must be handled with care and understanding.

The first requirement for guiding the program is an adequate system of accident records, as already described, to permit focus-

ing of enforcement efforts upon the locations, individuals, driving practices, or other features which offer the more important hazards.

The following are the main indications for the enforcement program to be derived from the accident records:

(1) The number and severity of accidents gives an index of the need for increased attention to the problem.

(2) The location file and spot map show where the motorcycle patrol and other enforcement officers should concentrate their efforts.

(3) The collision diagram indicates the character of improper driving at intersections calling for attention.

(4) The time analysis tells how the shifts of officers should be organized to give the proper proportion of available men on duty at various times.

(5) The type of accidents analysis shows the principal violations which should be concentrated upon. For example, in Massachusetts an analysis of the accident records showed that most of the accidents were caused by the following:

Operating at a speed too fast for conditions.

Passing another car going in the same direction when view is obscured.

Failing to keep to the right side of the road.

Failing to slow down at intersections.

Failing to slow down on approach to pedestrians.

Failing to observe law regarding passing street cars.

Violation of stop signs and traffic signals.

Dangerous parking.

(6) An analysis by names of the operators will show certain "repeaters" who commit more violations and have more accidents than the average. This makes it possible to devote special educational attention to them, to reexamine them for physical or other deficiencies, to confer with them as to their record and how it can be improved, or to increase their punishment until they improve or are removed from the road.

Every step in the enforcement program should be closely geared to the accidents and violations. For example, the number of accidents due to speed too fast for the conditions should be plotted on a graph against the number and percentage of arrests and convictions for that particular violation. An analysis of this sort in one large city showed, for example, that about 90 percent of the summonses were issued for parking violations, whereas they were involved in less than 10 percent of the serious accidents. On the other hand, failing to slow down at intersections, a major cause of accidents, was receiving almost no enforcement effort. In such a case enforcement should be increased on each particularly hazardous violation until the graph shows that accidents due to it have been reduced to a minimum. This analysis should be kept up to date week by week in order to keep the enforcement program in constant step with changing conditions.

As 45 to 60 percent of the fatal accidents involve pedestrians, there obviously should be a concentration of effort on accidents involving them.

LAW-OBSERVANCE STUDIES

Since the number of accidents of a particular type at a particular place will not usually be great enough in a short period to provide an accurate index, it is desirable to make special studies to determine the extent to which motorists or pedestrians are obeying the important regulations. If, for example, it is found that only one-third of the motorists stop at stop signs, more police attention and education are obviously required with respect to that violation. After the increased enforcement has been applied, another law-observance study should be made to determine whether the signs are

being satisfactorily obeyed. A study of prevailing speeds will assist the department to establish administrative instructions to the men as to when they should warn and when they should arrest. The figures will also be helpful in impressing the public with the necessity for increased enforcement. It is thus possible to exercise an intelligent influence in curbing dangerous violations without having to wait for the development of the accident record.

ACCIDENT-INVESTIGATION SQUADS

Since traffic laws prohibit almost all actions which cause accidents, it follows that whenever there has been an accident there has practically always been some violation. Whether logical or not, public opinion will more readily support punishment of an operator for doing something which caused an accident than for something which might have resulted but did not happen to result in disaster. And yet in most communities drivers who have accidents are seldom punished for the acts which caused them. Only a small percentage of the accidents are thoroughly investigated. In cases where they are, it is usually some time after the action took place, when the witnesses have left and the case in general is cold.

Communities with modern enforcement programs have a simple solution to this problem—the accident-investigation squad with its radio-equipped automobile “cruiser.” If radio-equipped cars are not available, telephones, teletype, pull boxes, and patrol cars can be used. By training the public to call a police station whenever an accident occurs, the authorities are able to dispatch experienced men promptly to the scene. Witnesses are thus usually available, photographs and measurements can be made, and the cars and drivers can be examined. This plan has resulted in greatly increasing the ratio of convictions to arrests and in providing definite punishment for nontechnical violations which result in accident. Trained police officers make up the record and file the complaint, whereas under the common procedure today when one of the parties involved files the complaint the criminal suit is frequently dropped if damages are paid. Thus an offense against the public safety goes unpunished and repetition is rendered more likely.

The public reaction to the use of accident-investigation squads as an aid to enforcement is good.

COMBATING THE “FIXING” EVIL

It is a well established principle that certainty of punishment is more important than severity. Under conditions where only a small proportion of those apprehended are convicted or punished in any way, the law does not mean much to the public. It is better to make fewer arrests and have conviction and punishment certain for those who commit major violations.

In many parts of the country the use of influence to avoid the consequences of traffic violations is a serious handicap to the enforcement program. Policies which have been found effective in combating this abuse include:

- (1) Making all regulations reasonable from the public viewpoint.
- (2) Using verbal warnings, cards, or letters for minor offenses.
- (3) Concentrating on the worst offenses and repeating offenders so that cases coming up will be strong ones and punishment obviously deserved.

(4) Using a triplicate tag system which requires recording of evidence in the office of the fiscal agent of the city, the police department, and the court.

(5) Public auditing of tickets and of enforcement results, as in Pittsburgh and Minneapolis. This places the altering of tickets on the same basis as changing the records of the treasury departments.

(6) Establishment of traffic-violations bureaus, which make it easier for the minor offender to pay than to exert effort through underground channels to defeat the law. Traffic-violations bureaus are also of value in relieving the courts of thousands of minor cases, thus freeing their time for more thorough consideration of major cases.

(7) Selection of competent magistrates and safeguarding them from improper influences.

(8) Public education regarding actions the police are going to take and the reasons for them.

(9) Publishing in newspapers the results of the court's action on each case.

ABOLITION OF FEE SYSTEM

The practice still prevails in some places whereby the county or municipality pays a certain fee to the arresting officer and to the judicial official hearing the case for each conviction secured. This practice, often called the "fee system", is obviously not in the interest of impartial justice to persons apprehended. The abuses arising from this system are many and serious. This practice is strongly condemned.

WARNINGS AND PENALTIES

To be effective, punishments should fit both the violation and the violator. Enforcement officers have often taken the attitude that the only way to punish a violator for minor offenses is through his pocketbook. The wealthy man or young driver whose family pays his fine for him thus escapes any seriously felt penalty. To meet varying requirements the following measures have been found effective:

(1) Warning tickets and letters which tell the motorist that his name is on file and that he has a record started against him.

(2) A sliding scale of fines, making mandatory increased punishment for repeated offenses.

(3) A traffic school for violators, providing "enforced education" for those who chiefly need education and for those to whom money means nothing, or those who cannot afford to pay.

(4) Hearings and interviews designed to find out deficiencies in the individual and convert him into a safe driver if possible.

(5) Paroles or suspended sentences for first offenders for all but the most serious violations, to give them a chance to show that they have mended their ways.

(6) Reexamination of all motorists who have a number of accidents or violations charged to them.

(7) License suspension and revocation, which are severe and effective punishments.

(8) Publication of convictions.

Enforcement authorities should use such of these well-known and proved methods as are most suitable in each case.

AMOUNT OF ENFORCEMENT NEEDED

Since it is definitely known that enforcement increased along the lines outlined above will materially reduce accidents, the question frequently arises as to how much enforcement is required and justi-

fied from the humanitarian and economic viewpoints. To establish this point, selective enforcement activities and punishments should be increased until the prospective results do not justify further increase in efforts.

In the development of such a program several different yardsticks should be established to measure what can be accomplished. These are as follows:

(1) A month-by-month comparison of the number of convictions for driving violations and the number of personal-injury accidents involved. The enforcement demonstration previously referred to indicated that for every accident involving personal injury there should be at least 10 convictions for driving violations in order to produce reasonably safe driving.

(2) The relationship between the number of warnings given and the number of convictions. Warnings alone, with no convictions, would give little if any results.

(3) The percentages of places, times of year, month and day, individual and types of actions on which enforcement efforts are concentrated, and the relationship of these percentages to the accident rate.

(4) Law observance studies of the before-and-after type as already described.

Such guides will be of great assistance to enforcement agencies in the direction of gaging increased efforts and exercising greater selectivity.

SPECIAL ENFORCEMENT MEASURES

The following enforcement measures, not at present in general use, are worthy of careful consideration.

POLICE DEPARTMENT SAFETY COMPETITIONS

Many police departments have found it advantageous to conduct a safety competition among precincts, platoons, and individual men. This tends to stimulate interest among the men and make possible the effective operation of many of the newer and more technical methods of accident reduction.

CONSPICUOUS POLICE CARS

Much can be done to influence drivers' behavior by making them realize that they are being watched and will be apprehended if they violate the law. In some jurisdictions this is being done by painting the enforcement vehicles white, red, or yellow, thus greatly increasing the knowledge of their presence. It is well established that when motorists see a motorcycle officer or police car they slow down. To deal with habitual violators or criminals, however, a certain proportion of police vehicles, although clearly marked, should not be painted with the identifying color.

CITIZEN OBSERVERS

In some communities citizen traffic-safety observers report violations, thus providing enforcement officials with additional records regarding individual drivers and enabling them to warn a large percentage of offenders who are not apprehended or seen by police officers.

MOBILE PUBLIC ADDRESS SYSTEM

Several enforcement administrators have successfully used microphone and loudspeaker systems mounted on police vehicles to control pedestrians at intersections and to warn drivers engaged in or about to commit a violation. The plan is worthy of more extended use.

MOTOR-VEHICLE EQUIPMENT INSPECTION

At modern speeds, brakes, steering, lighting, and other safety equipment of the car become very important. Fifteen States and numerous cities now have laws requiring periodic inspections. Every State and every city should have a special vehicle squad or inspection station or stations for checking up on equipment. In addition operators should be specifically punished for accidents due to unsafe equipment. Such activity has another effect on safety which may be even greater than that of providing safety equipment. It has a good psychological effect on the operator by making him realize that he is driving a vehicle which can become very dangerous if it is not properly maintained. Act V of the uniform vehicle code as revised provides for periodic inspections of motor vehicles.

ATTITUDE OF TRAFFIC OFFICERS TOWARD VIOLATORS

When a motorist is stopped for violation of a rule affecting safety, it should at once be made clear to him that his apprehension has a definite safety purpose. Each officer should know the facts regarding the hazards on his route or beat, so that he will know what driving practices it is most important to improve. Officers should concentrate their efforts at points where accidents have occurred or dangerous driving practices prevail and should be furnished the necessary information on these points. They should approach violators largely on an accident basis and say something like this:

You are being arrested for approaching that intersection at an unsafe rate of speed. Last year there were 15 accidents and 2 deaths at the intersection due to excessive speed. We are making arrests at places where accidents occur and for the acts which cause them.

This impresses the motorist with the fact that the officer knows his business and that there is a good reason for his action. The driver's attention will thus be directed to the purpose behind the law and not to apparently unimportant technicalities.

TRAFFIC SAFETY RESEARCH

The National Conference on Street and Highway Safety has long recognized the need for continuing research on many phases of the traffic problem to keep pace with constantly changing conditions. The conference committee on causes of accidents in 1926 listed a number of subjects on which research was needed. The Third National Conference in 1930 adopted a resolution urging the co-operation of the Federal Government through such technical research and fact-finding experimentation as could properly be conducted by the Bureau of Public Roads, the Department of Commerce, and

other governmental offices, and submitted a list of 14 typical problems calling for research.

The Bureau of Public Roads, the National Bureau of Standards and other governmental agencies have been doing extensive research work on some of these subjects during the last 7 years, as have the State and municipal authorities, safety organizations, and some of the universities. Nevertheless, there is abundant room for all of the research that can be conducted by these agencies as well as by the research foundations and by business groups which have a financial stake in preventing accidents.

SUGGESTED SUBJECTS FOR RESEARCH

The following are subjects on which there is need for research. Some of these have already been mentioned in the various parts of this report to which they relate.

ENGINEERING

1. Design of traffic islands, including medial, channelizing, rotary, and loading islands.
2. Divided roadways.
3. Safe approach speeds at blind intersections, curves, hills, and traffic signals.
4. Timing of traffic signals, particularly for pedestrians.
5. Further refinements in design and use of signs, signals, and markings.
6. Provisions for pedestrians on rural highways including sidewalks and paths.

ADMINISTRATION AND ENFORCEMENT

1. Organization of police traffic divisions in States and cities.
2. Traffic training for police officers.
3. Organization and operation of traffic courts.
4. Organization and operation of traffic-engineering offices.
5. Relation of traffic law enforcement to accidents.
6. Methods of enforcing speed laws.
7. Suspension and revocation procedure in motor vehicle departments.

EDUCATION AND PSYCHOLOGY

1. Methods and agencies for teaching safe driving.
2. Training courses for commercial-vehicle operators.
3. Model drivers' manual.
4. Accident-prone motorists.
5. Multiple causes of accidents.
6. Speed habits of drivers.
7. Relation of safety publicity to traffic accidents.

RECENT PROGRESS IN RESEARCH

Since the foregoing suggestions were prepared in 1934 there has been encouraging progress in traffic safety research.

Under a Congressional authorization of \$75,000 the Bureau of Public Roads, with cooperation of the Highway Research Board of the National Research Council, carried out in 1936-37 a program of research projects covering accident proneness of drivers, value of mechanical driver-testing equipment, causes of serious accidents, accident-reporting and investigation methods, and safety effects of maintenance systems used in motor-vehicle fleets. The Bureau, in its regular highway work, is also giving special attention to research in safety features of highway engineering.

The Interstate Commerce Commission, through the safety section of its Bureau of Motor Carriers, is investigating numerous safety aspects of commercial vehicle operation.

The American Association of Motor Vehicle Administrators, with cooperation of interested organizations, is conducting studies in the field of State traffic administration and enforcement.

Through their own programs, and with assistance of grants from the Automotive Safety Foundation, important traffic-research work has been undertaken by the National Safety Council, the American Automobile Association, the Harvard Bureau for Street Traffic Research, the Society of Automotive Engineers, and the International Association of Chiefs of Police. The National Conservation Bureau, Iowa State College, and other organizations are also conducting important research activities.

RESEARCH PROCEDURE

Research should be conducted in small units so that definite portions can be completed at an early date and be put into use as soon as possible. To be valid and convincing, a sufficient amount of data should be accumulated on each unit. Before any new research is to be undertaken, a careful search of the field should be made to determine what has already been accomplished.

Whenever possible, research should be conducted in cooperation with governmental traffic officials to insure practical application of the results.

It is recommended that interested organizations carefully consider the foregoing subjects for research and that each undertake one or more items not being carried out, with due regard to the plans of other interested groups.

CONCLUSION

In the foregoing, many-sided program every individual, every civic organization, and every public official who has any contact with traffic can and should participate.

The chief opportunity of one person or group may be in working actively for the adoption of the standard drivers' license system, another in remedying a chaotic parking situation, another in education of fleet drivers, in putting teeth into the enforcement program, in bringing about a comprehensive traffic survey. However, interest in a particular project, such as correcting conditions at an especially hazardous intersection or railroad crossing, should not prevent those in a position to do so from energetically supporting the larger elements of the safety program.

There is need for fixing definitely the responsibility for traffic safety in every State, every city, and every civic and industrial organization. And, finally, there is need for acceptance by every individual of his personal responsibility.

Except in rare instances, traffic accidents are not acts of God. They are acts of men. They can be prevented.

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